

Evaluation on the Criteria of Organisational Sustainability by Adopting ANP

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Abstract

Human activities have been putting a great burden on the earth, leading to many serious problems, such as lack of resources, ecological degradation and air degradation. Although many countries have recognised this circumstance and have developed some sustainable development strategies, the earth still needs research on sustainability in different views and various industries. The nursing industry has grown with the ageing of the global population in recent years, and professional nursing institutions could relieve structural deterioration caused by the ageing population in family, social, economic and cultural. Hence, exploring the key criteria of organisational sustainability in the nursing industry is of the utmost priority. This paper puts forward an evaluation framework to identify the key criteria of organisational sustainability. After connections with nursing homes A and B in China, the author adopts literature research to confirm the criteria system which is based on triple bottom line, utilises analytical network process method to design the network hierarchy analysis model and importance comparison questionnaires to collect experts' first-hand data, and uses technical software - Super Decisions to integrate data and obtain final results. The results recommend three top-ranked criteria in the entire system, eco-recruitment, eco-procurement and corporate social responsibility are discussed with some professional suggestions in the end. The limitations are also extended in the last chapter to provide future research perspectives.

Keywords: Organisational sustainability, Nursing industry, Triple bottom line, Analytical network process

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1. Introduction

Since the 1980s, human production and living behaviour have exceeded the carrying capacity of the earth, resulting in an imbalanced ecosystem and a series of environmental problems(Rees, 2003). As environmental issues become key issues in society, governments of many countries pay more attention to sustainable development and formulate many international policies to deal with the threat of environmental change(Urien and Kilbourne, 2011). The World Commission on Environment and Development(WCED) discussed the general concept of sustainability as “the development that meets the needs of the present without compromising the ability of future generations to meet their own needs”(WCED, 1987). Under the influence of various internal and external factors, organisations need to constantly innovate and progress in order to adapt to the constantly changing internal and external environment. The connotation of organisational sustainable development lies in the rational use of resources to realise the social value and environmental protection on the premise of improving economic profits and meeting market demands. The evaluation of organisational sustainability can be used for internal and external monitoring, reflection, and improvement of this connotation. According to the report of the United Nations, the ageing population of almost every country is increasing, and this phenomenon has been paid attention globally(Desa, 2015). With this ageing trend, coupled with the decline in the number of family members and the phenomenon of women starting to work outside the home, elderly nursing has shifted from traditional family care to the nursing institutions constantly rising in modern society(Somers, 2006; Gorgulu et al., 2010). It is estimated that the number of elderly people in nursing institutions would continue to grow in the coming decades(Zeng, 2012). The care agencies investigated in this research are the nursing institutions, which are the most common type of elderly care institutions.

Previous studies have shown some knowledge gaps in the research on the criteria of organisational sustainability. For example, Høgevoid and Svensson(2016) undertook a qualitative research with respect to companies in Norway, to prove that different directions were related to the development of corporate efforts in connection with corporate sustainability. Høgevoid et al.(2014) adopted purposeful sampling to investigate companies, then acquired the experienced business practices. However, it is of great argument that which aspects are the key criteria of organisational sustainability. It is meaningful if this research could collect data of the importance of various criteria of organisational sustainability and use a mathematical statistics

method to the rank priority of these criteria. Considering above, the purpose of this paper is to explore the key criteria of organizational sustainability under the background of Chinese nursing industry. To achieve this purpose, the author intends to implement an evaluation framework to identify the key criteria of the organisational sustainability.

Multi-criteria decision-making(MCDM), is an important branch of decision-making science and has been widely used in many fields. In simple terms, MCDM is used to sort the schemes with several criteria according to scientific rules so that decision-makers can make optimal decisions(Massam, 1988; Kahraman, 2008). MCDM method can contribute to weight relevant factors in order to clarify decision-making, thereby performing the role of decision-makers(Zare et al., 2016). There were many data analysis method applied for multi-criteria decision-making problems among previous studies, such as decision-making and trial evaluation laboratory(DEMATEL) method, technique for order preference by similarity to an ideal solution(TOPSIS) method and so on. For example, Qarnain et al.(2020) analysed factors necessitating conservation of energy in residential buildings of the Indian subcontinent for better analysis to study the interrelation of factors by DEMATEL. Kumar(2018) dealt with the uncertain issue of the supplier selection using integrated TOPSIS. The Analytic Network Process(ANP) is utilized as a popular MCDM technique to provide effective decision-support models(Moons et al., 2019). ANP is very popular in MCDM problems due to its flexibility and ability to capture both subjective and objective aspects of decisions, and it relies on the judgement of managers or professional knowledge so that it is regarded as a powerful tool for decision-making(Hummel et al., 2012). Compared with above, ANP could also consider correlations among the elements in the system consisted by them. Hence, this paper adopts ANP to evaluate the criteria of organisational sustainability.

This study will make contributions in the following aspects: (1) It constructs an evaluating system for organisational sustainability under triple bottom line, enriching the building of theoretical framework. Meanwhile, the system could be referenced to other fields when their sustainability are explored. (2) It transfers the subjective evaluation from experts on each two-group criteria of organisational sustainability into importance sequence of all criteria, thus transforming the assessment of criteria into a multi-criteria decision-making problem. (3) The results of the analysis present valid guidelines to improve sustainability. The rest of this study is organised as follows. Section 2 reviews the relevant literature. Section 3 addresses the methodology and proposed formulas. Section 4 discusses specific systems, analysis processes

and analytical results. The discussion and conclusions are presented in Section 5.

2. Literature review

2.1 Sustainability

Sustainability can be defined as “maintaining well-being over a long, perhaps even an indefinite period”. That conception focuses on the aspiration of human beings towards a better life on the one hand and the limitations imposed by nature, on the other hand(Kuhlman and Farrington, 2010). At the very beginning, the concept of sustainability is only discussed from the perspective of resource and environment. People in the past never harvested more crops than the newly increased production(Wiersum, 1995). The main discussing direction of WCED turned toward resource-efficiency and sustainability. Since then, many concepts, such as corporate sustainability(CS), corporate social responsibility(CSR) and corporate sustainability performance(CSP), have been emphasized and reaffirmed in academia and corporations for many times(Marshall and Brown, 2003). In fact, not only companies, every organisation in the business environment must implement sustainable development. Incorporating organisational sustainability(OS) into the business environment raises awareness of the corporate environment, social and economic capital(Kucukvar et al., 2014), then it might provide more opportunities by supports from governments and consumers. Therefore, OS becomes the resource of opportunities for organisations to remain competitive in this sense(Gimenez et al., 2012).

Previous studies have summed up the relevant research, Montiel(2008) provided a holistic review on the trends in academic research related to the above topics from the 1970s to the early 21st century, which reflected a consistent increase quantity of papers on those topics. Besides, he highlighted that all the terms in the manuscripts he analyzed showed great similarity that relied on the vision of CS. Amini and Bienstock(2014) also used these terms and they believed that an organisation, which wants to maintain fundamental sustainability in the long term, must consider all of the contexts in which it is embedded: economic, social and environmental. The three aspects of sustainability are interrelated and affect each other through a variety of means. Therefore, companies can not completely distinguish their economic sustainability from social and environmental sustainability(Elkington, 2013). This connotation is also the theoretical basis

for his approach to CS's research approach, triple bottom line(TBL)-social sustainability, economic sustainability, and environmental sustainability. Chen and Zhang(2020) evaluated the sustainability performance of 14 cities in China, distinguishing the shortboard and driving factors of the sustainable development in each city, whose sustainability index system based on TBL also provided a theoretical basis for the research framework of this article. However, a single theory to build an enterprise sustainable development evaluation system may not reflect the true situation of the organisational sustainable practice, affecting the general applicability of the evaluation results in the organisational practice(Depken and Zeman, 2018). organisational sustainable development evaluation needs to be constantly updated and adjusted according to the dynamic changes, and comprehensively use theory to build the theoretical basis of the evaluation system. Finally, the interactions between OS and other fields, such as knowledge management, innovation, were discussed in a practical way scientifically(Lopes et al., 2017).

Although there was plenty of research on sustainability, we can still find that sustainability research in some industries is insufficient. As a matter of fact, there almost does not exist any research which could be promoted to every industry, which is because there are some differences among various industries, including regulations and aims. For example, Chatzimouratidis and Pilavachi(2009) mentioned that sustainability criteria in power plant whose selection and weighting is decided according to the socio-economic and political framework or the context where they are established. The criteria, such as living standard(Chatzimouratidis and Pilavachi, 2008) and other aspects including capacity(Chang and Tu, 2007) and maintenance(Wang et al., 2007), are based on the attributes of the power industry. While in the farm industry, the sustainability evaluation criteria are agriculture-related, such as farm labour income per labour unit/regional per capita consumption and gross production/proxy of the value of non-renewable inputs(Andreoli and Tellarini, 2000). Obviously, the criteria among these industries are absolutely different, thereby making different conclusions. According to the existing literature, the research on the sustainable criteria evaluation have enveloped many industries, in addition to the electricity and agriculture mentioned above. There are also lots of contexts applied to evaluate sustainable criteria, such as software architectures(Koziolek, 2011), biodiesel production(Dinh et al., 2009) and so on. However, few studies chose the nursing industry as the evaluation background. If this study can obtain the key criteria of OS in the nursing industry, it would enrich the sustainable research and help the nursing industry to implement sustainable development more clearly. Hence, this

study targets nursing industry to implement the sustainability criteria evaluation. In the next part, nursing industry research will be illustrated comprehensively.

2.2 Research in nursing industry

Currently, there are many studies taking the nursing industry as the background. However, most of them focused on the supply-demand relationship of the nursing homes(NHS) (Csesko and Reed, 2009) and elderly people's caring preferences(Anderson and Turner, 2010). For example, Song and Tang(2001) counted the data on the occupation of nursing institutions in Shanghai, China, and calculated that the occupancy rate of Shanghai's NHS in 1999 surpassed 90% in the city centre while only about 25% in the suburbs. The research on preference included quantitative and qualitative research. The quantitative research involved cluster analysis(Li et al., 2015), multi-level linear regression(Mair et al., 2016), and so on, while the qualitative research could be implemented through one-to-one interview or focus group (Anderson and Turner, 2010; King and Farmer, 2009). Besides, NHS research was not yet abundant and exceptionally rare in the Chinese context(Lehnert et al., 2019). In the past, the academic contribution of the nursing industry was mostly reflected in sociology(e.g. Song et al., 2020) and medicine(e.g. Güler et al., 2012).

An evaluation research review in the nursing industry is going to be arranged in this paragraph. Ozcan et al.(1998) evaluated the efficiency of skilled nursing facilities, employing Data Envelopment Analysis(DEA) to assess objective data of a 10% national sample of 324 skilled nursing facilities stratified by ownership and size cluster groupings in the United States. That purpose was to find out the rationale for the differences among the differ-sized and differ-typed institutions. Therefore, the quantitative objective data analysis, including slacks and a logistic regression generated from DEA, were necessary. Karacsony et al.(2018) mentioned that evaluating aspects of palliative care competency in the nursing industry could use some measuring tools. For instance, the Palliative Care Quiz for Nurses(PCQN) (Ross et al., 1996) has been widely used to evaluate the nursing assistants' knowledge. Li and Home(2018) evaluated the effect of detailed nursing management in elderly patients during hospitalization, by randomly dividing into experimental group and control group, comparing the nursing safety and nursing satisfaction of the two groups of patients, thereby obtaining the advantages of the experimental group.

Critical thinking through the above review of literature, this part inducts some knowledge gaps. Firstly, previous studies mostly evaluated some specific variables, such as nursing facilities(Ozcan et al., 1998), satisfactions(Li and Home, 2018) and so on. The sustainability criteria in the nursing industry have rarely been researched. It is believed that exploring the key criteria of OS in the nursing industry could make a great contribution to nursing homes in sustainable development. Next, most research take the expert questionnaire method to implement the evaluation. Only calculating the percentage of agreement is enough to determine the result(Andy et al., 2020). In scientific research, if correlations of alternatives can be considered, the previous simplified idealized results may be improved. This paper considers that situation and shows better questionnaire effects.

2.3 Triple bottom line

Triple bottom line(TBL) was established by John Elkington in the middle of 1990s and aimed to include environmental and social dimensions into the traditional finance-centric measurement of business performance as an accounting framework in that period(Elkington, 1994). It is regarded as an efficient tool to achieve real sustainability in the long-term route(Wu and Pagell, 2011). Lozano(2008) thought that studies had been increasingly recognising TBL's role in contributing to sustainable development. TBL can be divided into three dimensions. First, it is extensively understood that economic sustainability has been operationalized as production or manufacturing costs at a practical level(Cruz and Wakolbinger, 2008). Second, environmental sustainability refers to the use of resources and energy, and the footprint organisations leave behind as a result of their operations. Usually, it is relevant with waste reduction, pollution reduction, energy efficiency, emissions reduction, a decrease in the consumption of hazardous/harmful/toxic materials, a decrease in the frequency of environmental accidents, etc.(Gimenez et al., 2012). Third, social sustainability means that organisations should provide fair opportunities, promote connection inside and outside the community, ensure the quality of life and provide accountable governance structures and democratic procedures(Elkington, 1994).

Since the Brundtland Commission came up with Sustainable Development(WCED, 1987), TBL has proven its several aspects' high vital significance with the deep research(Tseng et al., 2008; Shi et al., 2017) of some experts. Trianni et al.(2017) hold the view that the Chinese

industries still place more emphasis on economic than on environmental and social dimensions of sustainability. In recent years, the management field has increasingly incorporated sustainable views(Alfred and Adam, 2009), for example, the 2030 Agenda for Sustainable Development was adopted in the seventieth session of the General Assembly in 2015, which promoted the electronic industry's sustainable performance(Wu et al., 2019). Even so, TBL has still gotten many criticisms for its difficulties of implementation(Amini and Bienstock, 2014). Plenty of companies in America insisted that the more they focus on social and environmental sustainability, economic sustainability would suffer because of the costs incurred(Carter and Rogers, 2008; Nidumolu et al., 2009). Hussain et al.(2018) empirically explored the relationship between corporate governance and the TBL sustainability performance.

It is necessary to review the literature that used TBL theory to evaluate sustainability. Agrawal et al.(2016) evaluated the sustainable performance in reverse logistic aspect, selecting performance measures and estimating the weights via fuzzy analytical hierarchy process and extent analysis approach. The automobile manufacturing industry, as a competitive world industry, was getting upward pressure to keep environment green to go for sustainable manufacturing with green manufacturing. Nallusamy et al.(2016) adopted multi-grade fuzzy approach to calculate the environmental sustainability index and examine for improvement, improving the performance of environmental conditions by reviewing the sustainability of environmental desires. This study intends to apply TBL theory, dividing into three dimensions, extracting many criteria under the dimension of them, and selecting the key ones via scientific analysis approach. By reviewing this idea in the previous studies, this research idea was called multi-criteria decision-making problem. Similarly, Wang et al.(2019) proposed a multi-criteria decision-making(MCDM) framework to optimize the supplier evaluation and selection process in the garment industry using sustainability considerations.

2.4 Proposed method

Analytic Network Process(ANP) was established by Professor Thomas from the University of Pittsburgh(Thomas, 1996). As a decision-making method, ANP stemmed from AHP(Analytic Hierarchy Process), whose core is to divide the evaluation system into hierarchies, then identifying the most proper criteria by considering the functions of the upper element to the lower element. However, in many practical circumstances, the internal elements of each level

are often interdependent. In other words, there are lots of feedback among these criteria. Compared with AHP, ANP establishes network framework models instead of hierarchical ones. When solving practical problems, it is obvious that decision-makers often judge the relative importance of decision-making factors based on their situation (likes, experience, knowledge), which leads to some vacancies and incomplete information. When using ANP for decision analysis, by quantifying various criteria, or analysing multiple criteria that cannot be quantified together, considering the correlation or feedback relationship among elements at different levels, the data processing results can be more consistent with the real situation (Lee and Burnett, 2006). From another perspective, ANP considers interdependencies between elements in the whole system (Lee, 2010).

ANP has been applied in some circumstances throughout the previous studies. Unver and Gurbuz (2015) applied this method to evaluate a war environment's threat by prioritizing the targets. They designed a scenario with a number of aircrafts as elements, then transferred the practical problem into a multi-criteria decision-making problem. Giannakis et al. (2020) used ANP method to develop a sustainability performance measurement framework for supplier evaluation and selection, providing details on observing sustainable supply chain performance. Hashemi et al. (2015) established a green supplier selection model that enables decision-makers to use linguistic evaluation, which was an integrated innovation on method based on ANP. This was also an example of combination of MCDM methods, besides, ANP could be integrated with DEMATEL (Chen et al., 2019), Fuzzy (Rahmanita et al., 2018), and so on.

Exploring organisational sustainability in the nursing industry need professional experts to provide authoritative opinions, who has worked in this field for a long time. Meanwhile, the author must design expert questionnaires that explore the weight of the relationship between alternative criteria because it is supposed that the criteria of OS may exist internal influencing relationship. As a matter of fact, there exists a possible interaction relationship among all the possible criteria. It goes beyond this problem by systematically dealing with all kinds of dependence and feedback in the system. Meanwhile, decision-makers' judgements may be biased, ANP holds collective decision-making approach by aggregating individual opinions to prevent the bias of individual decision-makers. Hence, considering the research topic and research context of this paper, the ANP method is the best choice to implement the MCDM process of the evaluation on OS in the nursing industry.

3. Research method

In this section, the procedure of adopting ANP is outlined as follows.

Step 1: Identify criteria and their correlations. According to the investigation and analysis of the literature, the criteria of OS are identified. Based on these three dimensions in TBL, 11 criteria are extracted. Experts in the nursing industry analyse the correlations of each criterion on other ones, and then the chart of relating criteria can be acquired.

Step 2: Network model construction and importance evaluation. Establishing the network structure model is essential for the entire research, and this process can be implemented by the ANP software - Super Decisions. By clicking the choices of “cluster” and “nodes” under the “design” module and adding attributes and correlations of these indicators, an evaluation system can be constructed. Then, a questionnaire is distributed to collect the data of importance of each dimension or criterion under the standard of others. In this questionnaire, nine-level scaling method is used to evaluate these criteria(seen in Table 1).

Step 3: Judgment matrix construction and inconsistency test.

First, take a main dimension as the centre, and construct judgment matrices by comparing a certain dimension related to this. Then, take a certain criterion as the centre of gravity, and

<Table 1> Scores Significance

Score	Significance
1	C1 and C2 are equally important
3	Compared with C2, C1 is a little important.
5	Compared with C2, C1 is obviously important.
7	Compared with C2, C1 is strongly important.
9	Compared with C2, C1 is extremely important.
1/3	Compared with C1, C2 is a little important.
1/5	Compared with C1, C2 is obviously important.
1/7	Compared with C1, C2 is strongly important.
1/9	Compared with C1, C2 is extremely important.
2,4,6,8	Located between 1, 3, 5, 7, 9

establish judgment matrices for the related criteria. According to the results of questionnaires, it is necessary to transfer the contents of questionnaires into a matrix to express the relative importance among dimensions and criteria. The formula of the matrix is shown as follows.

$$C = |C_{ij}|_{n \times n} = \begin{vmatrix} 1 & C_{12} & \cdots & C_{1n} \\ C_{21} & 1 & \cdots & C_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ C_{n1} & C_{n2} & \cdots & 1 \end{vmatrix} \quad (1)$$

In order to ensure the decision-makers think questions consistently, the author intends to implement inconsistency check by the following formulas:

$$CI = \frac{\lambda_{\max} - n}{n - 1} \quad (2)$$

$$CR = \frac{CI}{RI} \quad (3)$$

Among them, $\lambda_{\max} = \max(\lambda_1, \lambda_2, \dots, \lambda_n)$, n represents the order of each judgment matrix; RI stands for the average random inconsistency index of the same order matrix; CI is used to test whether the decision-maker's thinking and judgment are consistent before and after. Here are some RI numbers of different orders, as shown in Table 2.

Due to the RI value of the matrix of the same order is fixed, the CR value is determined by the CI . The larger the CI value is, the larger the CR value will be.

If $CR = 0$, it means that the matrix has complete inconsistency, and the degree of inconsistency of the judgment matrix is the best;

If $CR \leq 0.1$, the inconsistency of the matrix is good, and the judgment matrix is acceptable;

If $CR > 0.1$, it indicates that the inconsistency of the judgment matrix is poor and the judgment matrix needs to be adjusted.

<Table 2> Average random inconsistency index

Order	1	2	3	4	5	6	7	8	9	10	11
RI	0.00	0.00	0.52	0.89	1.12	1.26	1.36	1.41	1.46	1.49	1.52

Step 4: Weightless super matrix construction.

According to the judgement matrices, calculate the normalised eigenvectors of each judgment matrix and summarise them into a comprehensive matrix, which is shown in Formula 4. Then, acquire n weightless super matrices (ϖ_s) under the dimension of Ds. Among them, ϖ_i stands for the collection of all the normalised eigenvectors of judgment matrices of criterion i. Hence, a total of n weightless super matrices can be constructed.

$$\varpi_s = \begin{matrix} C_1 \\ C_2 \\ \vdots \\ C_n \end{matrix} \begin{bmatrix} C_1 & C_2 & \cdots & C_n \\ \varpi_1 & & & \\ & \ddots & & \\ & & \ddots & \\ & & & \varpi_n \end{bmatrix} \quad (4)$$

Step 5: Weighted super matrix construction.

Similarly, select a main criterion (Ci) and compare the importance of Ci with other criteria. Then, judgement matrix can be acquired under the Ci and its column feature vector after normalization (seen in Formula 5).

$$\eta_j = (m_{1j}, m_{2j}, \dots, m_{nj})^T \quad (5)$$

Next, a weighted matrix M_s can be constructed directly, which is shown in Formula 6.

$$M_s = [\eta_1, \eta_2, \eta_3, \dots, \eta_n] = \begin{bmatrix} m_{11} & m_{12} & \cdots & m_{1n} \\ m_{21} & m_{22} & \cdots & m_{2n} \\ \vdots & \vdots & & \vdots \\ m_{n1} & m_{n2} & \cdots & m_{nn} \end{bmatrix} \quad (6)$$

Next, use ϖ_s and M_s from the last two steps to calculate the weighted super matrix by Formula 7. Also, there are n matrices to be acquired.

$$W_s = \varpi_s M_s \quad (7)$$

Step 6: Solution of limit matrix.

Due to the correlation influences among various indicators, the ranking of each criterion can be solved in order to solve the importance ranking according to Formula 8.

$$W_s' = \lim_{R \rightarrow \infty} W_s^R \quad (8)$$

Step 7: Ranking and analysis of the criteria.

4. Data collection and analysis

4.1 Evaluation system of organisational sustainability

After extracting criteria of OS under the dimensions of social sustainability, economical sustainability, and environmental sustainability from literature (as mentioned in Step 1), the author set up a criteria system table to list them, which is shown in Table 3.

<Table 3> Evaluation system of organisational sustainability

Dimensions	Criteria	References
social sustainability (D1)	corporate social responsibility (C1)	Fombrun, 2005
	employee motivation (C2)	Zámešník & Roman, 2014
	equal opportunities (C3)	Nikolaou et al., 2019
economical sustainability (D2)	risk management (C4)	Hofert & Koike, 2019
	sustainable service (C5)	Dyllick & Hockerts, 2002; Tseng & Huang, 2016
	product management (C6)	Wijethilake & Chaminda, 2017
	sustainability accounting (C7)	Passetti et al., 2014
environmental sustainability (D3)	eco-recruitment (C8)	Jabbour & de Sousa Jabbour, 2016
	environmental management (C9)	Ikram et al., 2019
	pollution prevention (C10)	Hart, 1995; Hart & Dowell, 2011
	eco-procurement (C11)	Ike et al., 2019

4.2 Data collection

Nursing homes A and B are two typical institutions in Chinese nursing industry. The author implemented two questionnaires with 10 experts possessing national certification in Nursing homes A and B. All of them are familiar with the organisational development situations of the nursing industry. The first focuses on the correlations among the criteria in order to construct the network model, while the second one concentrates on the importance comparisons. The author collects basic information of the participants (seen in Table 4).

<Table 4> Basic Information of Participants

Participants	Number	Percentage
Gender		
Male	5	50%
Female	5	50%
Age		
Under 30	2	20%
31 - 40	2	20%
41 - 50	5	50%
Over 50	1	10%
Working Age		
Under 3	0	0%
3 - 5	1	10%
5 - 10	5	30%
Over 10	4	30%
Education Background		
Below College	3	30%
Bachelor	4	40%
Master	3	30%
Nature of Job		
Leader	2	20%
Manager	5	50%
Staff	3	30%

4.3 Network model construction

The specific expressions of correlations are concluded as follows. These two-criteria groups exist mutual influencing relationships: C2 and C3, C4 and C7, C5 and C6, C6 and C7, C8 and C9, C9 and C10, C9 and C11, C10 and C11. While other signs of “√” mean that there is only unidirectional influencing relationship existing these two-criteria groups, such as C1 to C3, C1 to C8, etc. Due to the complicated network of influencing relationships among these criteria of OS, the dimensions that master these criteria form relationships of self-influencing relationship and mutual influencing relationship. The chart of relating indicators is shown in Table 5.

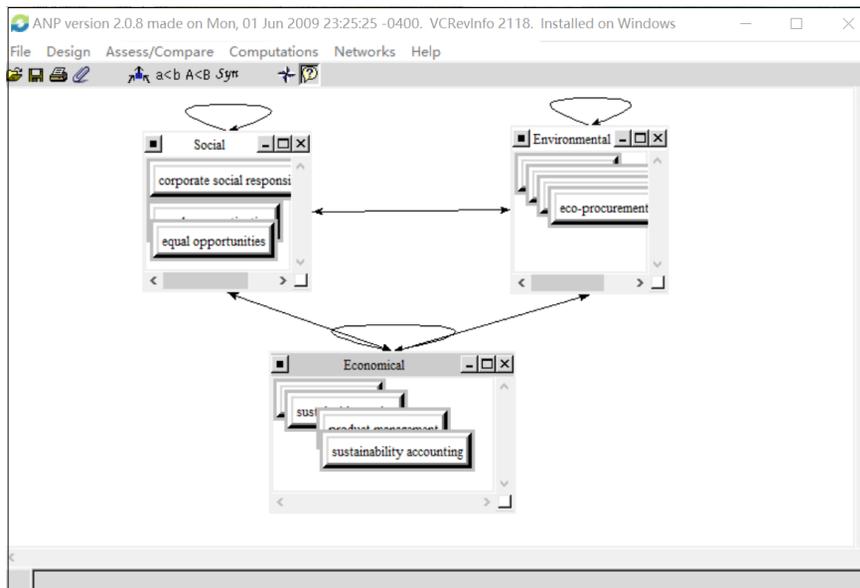
According to Step 2, network model can be constructed by Super Decisions, as shown in Figure 1.

<Table 5> Chart of relating criteria

		D1			D2				D3			
		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
D1	C1		√	√			√	√			√	√
	C2			√				√	√			
	C3	√	√									
D2	C4					√	√	√				
	C5		√	√			√					√
	C6			√	√	√		√	√			
	C7				√	√	√					
D3	C8	√	√							√		
	C9						√		√		√	√
	C10				√	√			√	√		√
	C11	√								√	√	

Description:

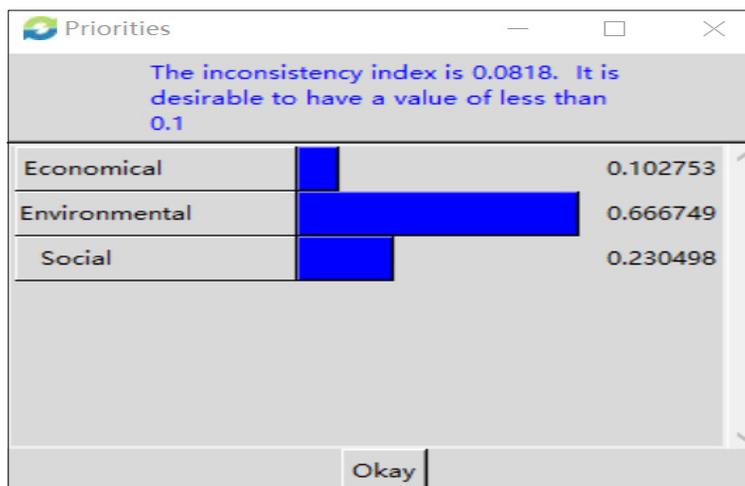
- (1) The vertical columns in the table indicate the influencing indicators, and the horizontal columns indicate the influenced indicators.
- (2) “√” means its corresponding vertical indicators influence horizontal indicators.



<Figure 1> Network model of the Criteria of Organisational Sustainability

4.4 Data analysis

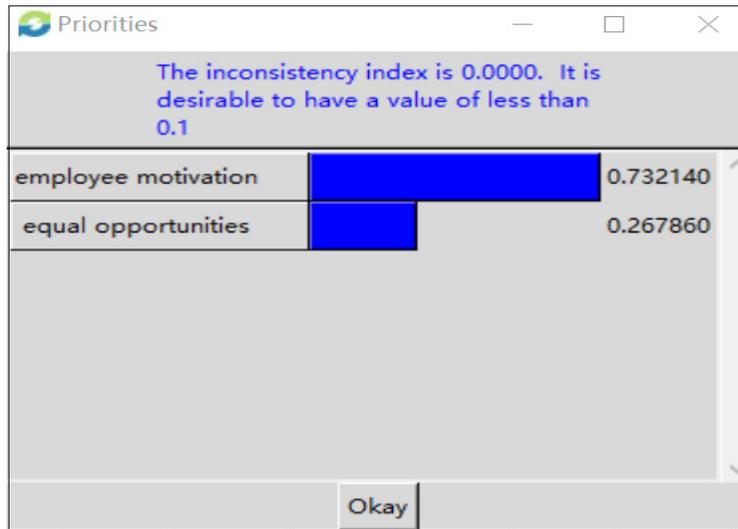
The processes of data analysis are carried out by Super Decisions, for the use in calculating the complicated multi-dimensions matrices. According to the Step 3, we can acquire several figures which reflect weight of indicators. Here is an example (seen in Figure 2).



<Figure 2> Weight of Dimensions(Take social as the main dimension)

All the calculation process can draw support from Super Decisions, as shown in Figure 2, the inconsistency is $0.0818 < 0.1$, which is acceptable. The weighted result is very credible. Besides, judgement matrix of 11 criteria should also be constructed, and here is an example of C1 (seen in Figure 3).

Then, corresponding weightless super matrix can be obtained as shown in Table 6, in Step 4.



<Figure 3> Inconsistency of C1

<Table 6> The Realisation of Unweighted Super Matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
C1	0.0000	0.8889	0.8750	0.0000	0.0000	1.0000	0.4545	0.0000	0.0000	1.0000	1.0000
C2	0.0000	0.0000	0.1250	0.0000	0.0000	0.0000	0.5455	1.0000	0.0000	0.0000	0.0000
C3	1.0000	0.1111	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C4	0.0000	0.0000	0.0000	0.0000	0.3546	0.3822	0.2500	0.0000	0.0000	1.0000	0.0000
C5	0.0000	1.0000	0.5000	0.0000	0.0000	0.2857	0.0000	0.0000	0.0000	0.0000	1.0000
C6	0.0000	0.0000	0.5000	0.1429	0.3016	0.0000	0.7500	1.0000	1.0000	0.0000	0.0000
C7	0.0000	0.0000	0.0000	0.8571	0.3438	0.3321	0.0000	0.0000	0.0000	0.0000	0.0000
C8	0.6667	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4197	0.4028	0.0000	0.0000
C9	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.2884	0.2949	0.2500	0.1667
C10	0.0000	0.0000	0.0000	1.0000	1.0000	0.0000	0.0000	0.2920	0.3023	0.0000	0.0000
C11	0.3333	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.7500	0.8333

<Table 7> The Realisation of weighted Super Matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
C1	0.0000	0.2049	0.6052	0.0000	0.0000	0.1020	0.0560	0.0000	0.0000	0.2851	0.2851
C2	0.0000	0.0000	0.0865	0.0000	0.0000	0.0000	0.0672	0.2851	0.0000	0.0000	0.0000
C3	0.2569	0.0256	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C4	0.0000	0.0000	0.0000	0.0000	0.2866	0.2774	0.2192	0.0000	0.0000	0.0623	0.0000
C5	0.0000	0.1028	0.1542	0.0000	0.0000	0.2074	0.0000	0.0000	0.0000	0.0000	0.0623
C6	0.0000	0.0000	0.1542	0.1155	0.2438	0.0000	0.6576	0.0623	0.0871	0.0000	0.0000
C7	0.0000	0.0000	0.0000	0.6928	0.2779	0.2411	0.0000	0.0000	0.0000	0.0000	0.0000
C8	0.4954	0.6668	0.0000	0.0000	0.0000	0.0000	0.0000	0.2739	0.3677	0.0000	0.0000
C9	0.0000	0.0000	0.0000	0.0000	0.0000	0.1721	0.0000	0.1882	0.2692	0.1632	0.1088
C10	0.0000	0.0000	0.0000	0.1917	0.1917	0.0000	0.0000	0.1906	0.2760	0.0000	0.0000
C11	0.2477	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4895	0.5439

<Table 8> The Realisation of Limit Matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
C1	0.1118	0.1118	0.1118	0.1118	0.1118	0.1118	0.1118	0.1118	0.1118	0.1118	0.1118
C2	0.0614	0.0614	0.0614	0.0614	0.0614	0.0614	0.0614	0.0614	0.0614	0.0614	0.0614
C3	0.0303	0.0303	0.0303	0.0303	0.0303	0.0303	0.0303	0.0303	0.0303	0.0303	0.0303
C4	0.0572	0.0572	0.0572	0.0572	0.0572	0.0572	0.0572	0.0572	0.0572	0.0572	0.0572
C5	0.0391	0.0391	0.0391	0.0391	0.0391	0.0391	0.0391	0.0391	0.0391	0.0391	0.0391
C6	0.0897	0.0897	0.0897	0.0897	0.0897	0.0897	0.0897	0.0897	0.0897	0.0897	0.0897
C7	0.0721	0.0721	0.0721	0.0721	0.0721	0.0721	0.0721	0.0721	0.0721	0.0721	0.0721
C8	0.1892	0.1892	0.1892	0.1892	0.1892	0.1892	0.1892	0.1892	0.1892	0.1892	0.1892
C9	0.1116	0.1116	0.1116	0.1116	0.1116	0.1116	0.1116	0.1116	0.1116	0.1116	0.1116
C10	0.0853	0.0853	0.0853	0.0853	0.0853	0.0853	0.0853	0.0853	0.0853	0.0853	0.0853
C11	0.1523	0.1523	0.1523	0.1523	0.1523	0.1523	0.1523	0.1523	0.1523	0.1523	0.1523

In Step 5, the weighted super matrix can be calculated, as shown in Table 7.

In line with Step 6, the solution of the limit matrix can be acquired, as shown in Table 8.

4.5 Data results

From Table 6, the limit matrix shows 11 rows of vectors with the same value. These values are the comprehensive weight value of each criterion. The author takes the same number in each row and arranges them by size in Table 9.

<Table 9> Index Weighting of Criteria

Criterion	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Weighting	0.1118	0.0614	0.0303	0.0572	0.0391	0.0897	0.0721	0.1892	0.1116	0.0853	0.1523

<Table 10> The sequence of Index Weighting

Criterion	Weighting	Rank
C8	0.1892	1
C11	0.1523	2
C1	0.1118	3
C9	0.1116	4
C6	0.0897	5
C10	0.0853	6
C7	0.0721	7
C2	0.0614	8
C4	0.0572	9
C5	0.0391	10
C3	0.0303	11

In order to intuitively identify the importance of the criteria, Table 10 rearranges them according to the size of the weight value.

It is easy to recognise that eco-recruitment(C8), eco-procurement(C11) and corporate social responsibility(C1) are the three top-ranked criteria.

5. Discussion

There are several theoretical implications in this study. Firstly, this study enriches the research on the OS in the context of the nursing industry, which is also a supplement to the theoretical research of this industry reversely. Secondly, this study constructs an evaluation criteria system of OS, which is generated from previous literature research, laying a solid foundation for the holistic framework. Once more, this study adopts ANP method to identify the key criteria of OS, and considering internal correlations makes the results closer to reality.

When it comes to managerial implications, the most important criteria of OS is

eco-recruitment(C8), almost occupied with one-fifth of the whole network. Eco-recruitment means that organisations assimilate criteria of sustainability into the recruitment procedures to accelerate the common environmental commitment of its internal staff(Jabbour and de Sousa Jabbour, 2016). The recruitment assessment has incorporated the interview on sustainability topics to examine the employees' sustainable awareness. In addition, the recruitment advertisement should be paid great attention by the human resource specialist because worker selection processes materialise in recruiters' communication before becoming face-to-face interactive encounters, such as job interviews or probationary periods. In other words, the recruitment advertisement can thus be considered the first interaction between employers and prospective employees(Castellini, 2019).

Eco-procurement(C11) lies in the second important criteria of OS, which demands organisations develop a green procurement policy and require its suppliers to follow to ensure that all parts are eco-friendly, thereby making efforts to protect the environment in achieving green procurement and production(Ike et al., 2019). Sönnich and Jesper(2020) reviewed preliminary publications on green and sustainable public procurement from the year 2000 to 2020, then concluded that how awareness and knowledge of circular public procurement attributes, based on circular policy and strategy implementation, are essential to conducting circular public procurement. The managers in nursing homes agreed with that and supplemented the procurers should be arranged some professional training to not only enhance their analysis skills but also cultivate their beliefs and values, thereby finding an optimum combination of risk, timeliness and cost.

Corporate social responsibility(C1) holds the third position in the network of criteria of OS in the nursing industry. This topic has been extensively concerned for a long period, and the theoretical research of corporate social responsibility performs great connections with practical activities of organisations(Islam et al., 2020; Ye et al., 2020). Also, previous research has admitted the association between corporate social responsibility and the idea that organisations should integrate social, economical and environmental sustainability as one part of their philosophy(Gustavo et al., 2018). Hence, from this view, corporate social responsibility is rational key criteria of sustainability. The managers also highlighted the importance of this criterion and regarded that this criterion may be applied in every industry. In nursing homes A and B, the working gravity centre is how to forecast and improve sustainable performance by the encouragements of corporate social responsibility.

6. Conclusion

Based on sufficient literature research, this paper adopts the triple bottom line(TBL) theory to divide OS and uses social sustainability(D1), economic sustainability(D2), and environmental sustainability(D3) as first-level indicators(dimensions) to extract second-level indicators (criteria), Thereby, an evaluation system of OS, including multi-level criteria, is constructed. Then, a questionnaire is distributed to confirm the influencing relationship between each two-group criteria is discussed to establish an evaluation network model. Next, the second questionnaire is issued to score the importance of criteria of OS. Using super decisions software can analyse the data and get the importance ranking of these criteria.

Eco-recruitment(C8), eco-procurement(C11) and corporate social responsibility(C1) from environmental sustainability(D3) and social sustainability(D1) are obtained as the three top-ranked criteria, and the author provides suggestions along with the experts. This study recommended that the recruitment advertisement should be concerned before the candidates are enrolled. Also, cultivating employees' belief and values is beneficial to practice eco-procurement. Then, corporate social responsibility could encourage the sustainable performance to enhance OS in the nursing industry through practical activities. Finally, this study successfully explores the key criteria of OS in the nursing industry.

Indeed, there are several limitations to this paper that provide opportunities for further research. One is the subjectivity of the questionnaire, and this study adopts a questionnaire method relying on experts' absolutely. Although experts' experience is very important to analyse and solve problems, it also has the disadvantage of strong subjectivity. Future research could add some objective data to reduce subjectivity. Foremost, despite this study adopted the triple bottom line(TBL) as the core theory to divide the OS, showing great theoretical basis. Yet the era is increasingly advancing, and the organisations are constantly reforming, the connotation of OS is constantly deepening and enriching, and future research should adjust, update and improve relevant theories and evaluation indicators promptly.

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